

CLAIMS

WHAT IS CLAIMED IS:

1. A method for constructing a query system for use with a body of data, comprising operations of:
 - providing a data schema describing entries in a body of data such that the entries provide instances of the data schema;
 - providing multiple appearance templates each providing instructions for computer presentation of on-screen constructs to receive user input of query parameters;
 - providing multiple subquery generators each comprising machine-executable code to prepare machine-executable query instructions applying a predetermined logical operation to the body of data;
 - providing multiple control schemas each control schema prescribing constituent components of query form controls providing instances of that control schema, the prescribed components of each control schema comprising:
 - specification of at least one appearance template and at least one subquery generator;
 - mapping between the specified appearance template and the data schema and between the specified subquery generator and the data schema;
 - providing one or more query form schemas prescribing constituent components of corresponding query form annotations that provide instances of the query form schemas, said components comprising:
 - identification of one or more of instances of the control schemas;

22 identification of elements of the data schema to be presented in query
23 results.

1 2. The method of claim 1, wherein the control schemas are separate from the query
2 form schemas.

1 3. The method of claim 1, further comprising operations of developing the query
2 system, comprising:
3 constructing one or more controls, each control comprising an instance of one of the
4 control schemas;
5 constructing one or more query form annotations, each annotation comprising an
6 instance of one of the query form schemas.

1 4. The method of claim 3, wherein the control schemas are integrated into the query
2 form schemas, and the operations of constructing the query form annotations includes the
3 operation of constructing the controls.

1 5. The method of claim 3, further comprising operations of compiling the query form
2 annotations, comprising for each query form annotation:
3 constructing a query form web page including the appearance templates specified
4 by the controls identified by said query form annotation;
5 in association with the constructed query form web page, initializing the subquery
6 generators specified by the controls identified by said query form annotation.

6. The method of claim 5, further comprising run-time operations, comprising:
responsive to user request submitted via web browser, outputting one of the query
form web pages to the web browser;
receiving query parameters submitted by the web browser in completion of the query
form web page;
executing the subquery generators initialized in association with the query form web
page to prepare machine-readable query instructions according to the query
parameters;
executing the query instructions upon the body of data and receiving an output of
query results responsive to execution of the query request;
transmitting web browser compatible presentation code representing the query
results to the web browser.

7. The method of claim 5, further comprising operations of reconfiguring the query
system after the compiling operations comprising:
revising contents of at least one of the following:
one or more of the controls;
one or more of the query form annotations;
one or more subquery generators;
one or more appearance templates;
performing recompilation operations for target query form annotations including at
least each revised query form annotation, and each query form annotation
having revised subcomponents;
said recompilation operations comprising, for each target query form annotation,

constructing a query form web page including the appearance templates specified by the controls identified by the target query form annotation, and initializing the subquery generators specified by the controls identified by the target query form annotation.

8. The method of claim 6, where:

the run-time operations further comprise, before the transmitting operation, preparing rendering instructions for transforming the query results into web browser compatible presentation code representative of the query results; the transmitting operation further comprise executing the rendering instructions to prepare the presentation code.

9. The method of claim 6, where the transmitting operation comprises transmitting presentations code presenting the query results in the query form web page being output to the web browser.

10. A method of developing a query structure that includes a data schema describing entries in a body of data such that the entries provide instances of the data schema; multiple appearance templates each providing instructions for computer presentation of on-screen constructs to receive user input of query parameters; multiple subquery generators each comprising machine-executable code to prepare machine-executable query instructions applying a predetermined logical operation to the body of data; multiple control schemas each control schema prescribing constituent components of a different query form control, the components of each control schema including specification of at least one

9 appearance template and at least one subquery generator and mapping between the
10 specified appearance template and the data schema and between the specified subquery
11 and the data schema; one or more query form schemas prescribing constituent
12 components of corresponding query form annotations said components including
13 designation of one or more controls and designation of elements of the data schema to be
14 presented in query results; the method of developing the query structure comprising
15 operations of:

16 constructing one or more controls, each control comprising an instance of the
17 control schema;

18 constructing one or more query form annotations, each annotation comprising an
19 instance of the query form schema.

20
21 11. A process of constructing a query system for use with a body of data, comprising
22 operations of:

23 providing a data schema describing entries in a body of data such that the entries
24 provide instances of the data schema;

25 providing multiple appearance templates each providing instructions for computer
26 presentation of on-screen constructs to receive user input of query
27 parameters;

28 providing multiple subquery generators each comprising machine-executable code
29 to prepare machine-executable query instructions applying a predetermined
30 logical operation to the body of data;

31 providing one or more query form schemas prescribing constituent components of
32 corresponding query form annotations that provide instances of the query

13 form schemas, said components comprising:
14 specification of at least one appearance template and at least one subquery
15 generator;
16 mapping between the specified appearance template and the data schema
17 and between the subquery generator and the data schema;
18 identification of elements of the data schema to be presented in query
19 results.

1 12. The method of claim 11, further comprising operations of developing the query
2 system, comprising:
3 constructing one or more query form annotations, each annotation comprising an
4 instance of one of the query form schemas.

1 13. The method of claim 12, further comprising operations of compiling the query form
2 annotations, comprising for each query form annotation:
3 constructing a query form web page including the appearance templates specified
4 by the query form annotation;
5 in association with the constructed query form web page, initializing the subquery
6 generators specified by the query form annotation.

1 14. The method of claim 13, further comprising run-time operations, comprising:
2 responsive to user request submitted via web browser, outputting one of the query
3 form web pages to the web browser;
4 receiving query parameters submitted by the web browser in completion of the query

5 form web page;
6 executing the subquery generators initialized in association with the query form web
7 page to prepare machine-readable query instructions according to the query
8 parameters;
9 executing the query instructions upon the body of data and receiving an output of
10 query results responsive to execution of the query request;
11 transmitting web browser compatible presentation code representing the query
12 results to the web browser.

1 15. The method of claim 13, further comprising operations of reconfiguring the query
2 system after the compiling operations, comprising:
3 revising contents of at least one of the following:
4 one or more of the query form annotations;
5 one or more subquery generators;
6 one or more appearance templates;
7 performing recompilation operations for target query form annotations including at
8 least each revised query form annotation, and each query form annotation
9 having revised subcomponents;
10 said recompilation operations comprising, for each target query form annotation,
11 constructing a query form web page including the appearance templates
12 specified by the target query form annotation, and initializing the subquery
13 generators specified by the target query form annotation.

1 16. The method of claim 14, where:

the run-time operations further comprise, before the transmitting operation,
preparing rendering instructions for transforming the query results into web
browser compatible presentation code representative of the query results;
the transmitting operation further comprises executing the rendering instructions to
prepare the presentation code.

17. The method of claim 14, where the transmitting operation comprises transmitting
presentation code presenting the query results in the query form web page being output to
the web browser.

18. A method of developing a query structure that includes a data schema describing
entries in a body of data such that the entries provide instances of the data schema;
multiple appearance templates each providing instructions for computer presentation of on-
screen constructs to receive user input of query parameters; multiple subquery generators
each comprising machine-executable code to prepare machine-executable query
instructions applying a predetermined logical operation to the body of data; one or more
query form schemas prescribing constituent components of corresponding query form
annotations said components including (1) specification of at least one appearance
template and (2) specifications of at least one subquery generator and (3) mapping
between the specified appearance template and the data schema and between the
subquery generator and the data schema and (4) designation of elements of the data
schema to be presented in query results, the method of developing the query structure
comprising operations of:

constructing one or more query form annotations, each annotation comprising an

15 instance of the query form schema.

1 19. A signal-bearing medium tangibly embodying a program of machine-readable
2 instructions executable by a digital processing apparatus to perform operations for
3 providing a query system for use with a body of data, said operations comprising:
4 providing a data schema describing entries in a body of data such that the entries
5 provide instances of the data schema;
6 providing multiple appearance templates each providing instructions for computer
7 presentation of on-screen constructs to receive user input of query
8 parameters;
9 providing multiple subquery generators each comprising machine-executable code
10 to prepare machine-executable query instructions applying a predetermined
11 logical operation to the body of data;
12 providing multiple control schemas each control schema prescribing constituent
13 components of query form controls providing instances of that control
14 schema, the prescribed components of each control schema comprising:
15 specification of at least one appearance template and at least one subquery
16 generator;
17 mapping between the specified appearance template and subquery generator
18 and the data schema;
19 providing one or more query form schemas prescribing constituent components of
20 corresponding query form annotations that provide instances of the query
21 form schemas, said components comprising:
22 identification of one or more of instances of the control schema;

23 identification of elements of the data schema to be presented in query
24 results.

1 20. A signal-bearing medium tangibly embodying a program of machine-readable
2 instructions executable by a digital processing apparatus to perform operations for
3 providing a query system for use with a body of data, said operations comprising:
4 providing a data schema describing entries in a body of data such that the entries
5 provide instances of the data-schema;
6 providing multiple appearance templates each providing instructions for computer
7 presentation of on-screen constructs to receive user input of query
8 parameters;
9 providing multiple subquery generators each comprising machine-executable code
10 to prepare machine-executable query instructions applying a predetermined
11 logical operation to the body of data;
12 providing one or more query form schemas prescribing constituent components of
13 corresponding query form annotations that provide instances of the query
14 form schemas, said components comprising:
15 specification of at least one appearance template and at least one subquery
16 generator;
17 mapping between the specified appearance template and subquery generator
18 and the data schema;
19 identification of elements of the data schema to be presented in query
20 results.

- 1 21. A query processing platform, comprising:
- 2 multiple control schemas, and multiple query form controls each comprising an
- 3 instance of one of the control schemas;
- 4 one or more query form schemas and multiple query form annotations each
- 5 comprising an instances of one of the query form schemas;
- 6 a data schema;
- 7 appearance templates;
- 8 a compiler including access to the controls, annotations, and appearance templates;
- 9 a run-time engine including a query rendering engine and a query assembler;
- 10 subquery generators accessible by the assembler and the compiler.
- 11 22. A query processing system, comprising:
- 12 a data schema describing entries in a body of data such that the entries provide
- 13 instances of the data schema;
- multiple appearance templates each providing instructions for computer
- presentation of on-screen constructs to receive user input of query
- parameters;
- multiple subquery generators each comprising machine-executable code to prepare
- machine-executable query instructions applying a predetermined logical
- operation to the body of data;
- multiple control schemas each control schema prescribing constituent components
- of query form controls providing instances of that control schema, the
- prescribed components of each control schema comprising:
- specification of at least one appearance template and at least one subquery

14 generator;
15 mapping between the specified appearance template and the data schema
16 and between the specified subquery generator and the data schema;
17 a query form schema prescribing constituent components of query form annotations
18 that provide instances of the query form schema, said components
19 comprising:
20 identification of one or more of instances of the control schema;
21 identification of elements of the data schema to be presented in query
22 results.

23. The system of 22, further comprising:
one or more controls, each control comprising an instance of the control schema;
one or more query form annotations, each annotation comprising an instance of the
query form schema.

24. The system of claim 22, further comprising a compiler programmed to perform
operations to process query form annotations, the operations comprising, for each query
form annotation:
constructing a query form web page including the appearance templates specified
by the controls identified by said query form annotation;
in association with the constructed query form web page, initializing the subquery
generators specified by the controls identified by said query form annotation.

25. The system of claim 24, further comprising:

an assembler programmed to receive query parameters submitted by the user's on-screen completion of one of the constructed query form web pages, execute the subquery generators initialized in association with the query form web page to form a machine-readable query request according to the query parameters, and initiate execution of the query request upon the body of data;

a rendering engine programmed to receive an output of query results responsive to execution of the query request, and present the query results to the user.

26. A reconfigurable web-browser-compatible query system, comprising:
- a data schema describing a body of data to be queried;
 - multiple appearance templates;
 - multiple controls each control comprising:
 - specification of at least one of the appearance templates and at least one subquery generator;
 - mapping between the specified appearance template and the data schema and between the specified subquery generator and the data schema;
 - one or more query form annotations comprising:
 - identification of one or more of controls;
 - identification of elements of the data schema to be presented in query results;
 - a compiler to create web-browser-compatible representations of the query form annotations;
 - a run-time engine comprising an assembler to construct queries against the data

16 schema according to query parameters submitted by user completion of the
17 web-browser-compatible representations and a rendering engine to provide
18 web-browser-compatible outputs of query results.

1 27. The system of claim 26, where:
2 the system further comprises multiple of the subquery generators each such query
3 generator comprising machine-executable code to prepare query instructions
4 applying a prescribed logical operation to the body of data;
5 the assembler is configured to construct queries against the data schema by
6 assembling and activating the subquery generators specified by the query
7 form annotations.

1 28. A query processing system, comprising:
2 data schema means describing entries in a body of data such that the entries
3 provide instances of the data schema;
4 multiple appearance template means each for providing instructions for computer
5 presentation of on-screen constructs to receive user input of query
6 parameters;
7 multiple subquery generator means each for preparing machine-executable query
8 instructions applying a predetermined logical operation to the body of data;
9 multiple control schema means each for prescribing constituent components of
10 query form controls providing instances of that control schema, the
11 prescribed components of each control schema comprising:
12 specification of at least one appearance template means and at least one

13 subquery generator means;
14 mapping between the specified appearance template means and the data
15 schema means and between the specified subquery generator and the
16 data schema means;
17 query form schema means for prescribing constituent components of query form
18 annotations that provide instances of the query form schema, said
19 components comprising:
20 identification of one or more of instances of the control schema means;
21 identification of elements of the data schema to be presented in query
22 results.

29. A reconfigurable web-browser-compatible query system, comprising:
data schema means for describing a body of data to be queried;
multiple appearance template means;
multiple control means each for:
specifying at least one of the appearance template means and at least one
subquery generator means;
mapping between the specified appearance template and the data schema
means and between the specified subquery generator and the data
schema;
one or more query form annotation means for:
identifying one or more of control means;
identifying elements of the data schema means to be presented in query
results;

14 compiler means for creating web-browser-compatible representations of the query
15 form annotation means;
16 a run-time engine comprising an assembler means for constructing queries against
17 the data schema means according to query parameters submitted by user
18 completion of the web-browser-compatible representation and rendering
19 engine means for providing web-browser-compatible outputs of query results.

1 30. A query processing platform, comprising:
2 multiple query form schemas and multiple query form annotations each comprising
3 an instance of one of the query form schemas;
4 a data schema;
5 appearance templates;
6 a compiler including access to the annotations and appearance templates;
7 a run-time engine including a query rendering engine and a query assembler;
8 subquery generators accessible by the assembler and the compiler.

1 31. A query processing system, comprising:
2 a data schema describing entries in a body of data such that the entries provide
3 instances of the data schema;
4 multiple appearance templates each providing instructions for computer
5 presentation of on-screen constructs to receive user input of query
6 parameters;
7 multiple subquery generators each comprising machine-executable code to prepare
8 machine-executable query instructions applying a predetermined logical

operation to the body of data;
query form schemas prescribing constituent components of corresponding query
form annotations that provide instances of the query form schemas, said
components comprising:
specification of at least one appearance template and at least one subquery
generator;
mapping between the specified appearance template and the data schema
and between the specified subquery generator and the data schema;
identification of elements of the data schema to be presented in query
results.

32. The system of 31, further comprising:
one or more query form annotations, each annotation comprising an instance of the
query form schema.

33. The system of claim 31, further comprising a compiler programmed to perform
operations to process query form annotations, the operations comprising, for each query
form annotation:

constructing a query form web page including the appearance templates specified
by the query form annotation;
in association with the constructed query form web page, initializing the subquery
generators specified by the query form annotation.

34. The system of claim 33, further comprising:

an assembler programmed to receive query parameters submitted by the user's on-screen completion of one of the constructed query form web pages, execute the subquery generators initialized in association with the query form web page to form a machine-readable query request according to the query parameters, and initiate execution of the query request upon the body of data;

a rendering engine programmed to receive an output of query results responsive to execution of the query request, and present the query results to the user.

35. A reconfigurable web-browser-compatible query system, comprising:
- a data schema describing a body of data to be queried;
 - multiple appearance templates;
 - query form annotations each comprising:
 - specification of at least one of the appearance templates and at least one subquery generator;
 - mapping between the specified appearance template and the data schema and between the specified subquery generator and the data schema;
 - identification of elements of the data schema to be presented in query results;
 - a compiler to create web-browser-compatible representations of the query form annotations;
 - a run-time engine comprising an assembler to construct queries against the data schema according to query parameters submitted by user completion of the web-browser-compatible representations and a rendering engine to provide

16 web-browser-compatible outputs of query results.

1 36. The system of claim 35, where:

2 the system further comprises multiple of the subquery generators each subquery
3 generator comprising machine-executable code to prepare query instructions
4 applying a prescribed logical operation to the body of data;
5 the assembler is configured to construct queries against the data schema by
6 assembling and activating the subquery generators specified by the query
7 form annotations.

1 37. A query processing system, comprising:

2 data schema means for describing entries in a body of data such that the entries
3 provide instances of the data schema;
4 multiple appearance template means each for providing instructions for computer
5 presentation of on-screen constructs to receive user input of query
6 parameters;
7 multiple subquery generator means each for preparing machine-executable query
8 instructions applying a predetermined logical operation to the body of data;
9 query form schema means for prescribing constituent components of corresponding
10 query form annotations that provide instances of the query form schemas,
11 said components comprising:
12 specification of at least one appearance template means and at least one
13 subquery generator means;
14 mapping between the specified appearance template means and the data

15 schema means and between the specified subquery generator and the
16 data schema means;
17 identification of elements of the data schema to be presented in query
18 results.

1 38. A reconfigurable web-browser-compatible query system, comprising:
2 data schema means for describing a body of data to be queried;
3 multiple appearance template means;
4 query form annotation means for:
5 specifying at least one of the appearance template means and at least one
6 subquery generator means;
7 mapping between the specified appearance template means and the data
8 schema means and between the specified subquery generator and the
9 data schema means;
10 identifying elements of the data schema to be presented in query results;
11 compiler means for creating web-browser-compatible representations of the query
12 form annotations;
13 a run-time engine comprising an assembler means for constructing queries against
14 the data schema means according to query parameters submitted by user
15 completion of the web-browser-compatible representations and rendering
16 engine means for providing web-browser-compatible outputs of query results.